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Advancements in Breeding Fusarium-Resistant Vanilla Varieties Using Next Generation Sequencing

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Demand for natural vanilla flavor is increasing, but the cultivated Vanilla planifolia faces critical challenges in response to biotic and abiotic stresses. In particular, Root and Stem Rot (RSR) disease caused by Fusarium oxysporum f. sp. radicis-vanillae (Forv) is the most damaging disease of vanilla. What can we do to reduce the damage? Prophylactic measures and use of chemicals or biocontrol agents are not effective in controlling RSR in the field. In this context, the use of resistant varieties is the best option to reduce Fusarium impact. Low genetic diversity has been detected within V. planifolia in accordance with the vegetative mode of dispersion of the vine. However, among the V. planifolia cultivars conserved in the Biological Resources Center Vatel at CIRAD La Réunion, several showed Forv resistance in lab tests as well as in the field. The exploration and deciphering of vanilla genomes using Next Generation Sequencing (NGS) provides a real reservoir of knowledge in support to the vanilla breeding programs. In particular, it opens access to genes involved in RSR plant resistance, allowing the development of molecular markers genetically linked to resistance.

Félicien Favre is a PhD student from the University of La Réunion working in the Joint Research Unit Cirad-University of La Réunion “Plant Populations and Bio-aggressors in Tropical Ecosystems”. He started studying plant biology and genetics at the University of Paris-Saclay (France) and Ludwig Maximilian University of Munich (Germany). During his college studies, he focused on fungi affecting field crops. He has worked first on the impact of the temperature changes on Zymoseptoria tritici populations, the disease agent of the Septoria tritici blotch of wheat. Then he joined the CIRAD La Réunion to study vanilla diversity and genetic resistance to Fusarium using Next Generation Sequencing. His PhD work should enhance the development of novel breeding strategies aimed at improving the genetic control of RSR of vanilla.